

Contents

I	ActiveAx	3
1	Pilot study of scan/rescn reproducibility in the corpus callosum and spinal cord	5

Part I

ActiveAx

Chapter 1

Pilot study of scan/rescn reproducibility in the corpus callosum and spinal cord

Table 1.1: ICC values for whole CC and individual ROIs for a and ρ estimates.

	<i>whole CC</i>	<i>Individual ROIs</i>									
		G1	G2	G3	B1	B2	B3	I	S1	S2	S3
a	0.66 ■	0.14 ■	0.83 ■	0.56 ■	0.14 ■	0.81 ■	0.46 ■	-0.25 ■	-0.07 ■	0.70 ■	0.94 ■
ρ	0.79 ■	0.74 ■	0.77 ■	0.78 ■	0.44 ■	0.59 ■	0.34 ■	0.79 ■	-0.14 ■	0.34 ■	0.73 ■
Guidelines for agreement (?): ■ < 0.2: poor, ■ 0.2–0.4: fair, ■ 0.4–0.6: moderate, ■ 0.6–0.8: substantial, ■ > 0.8: almost perfect											

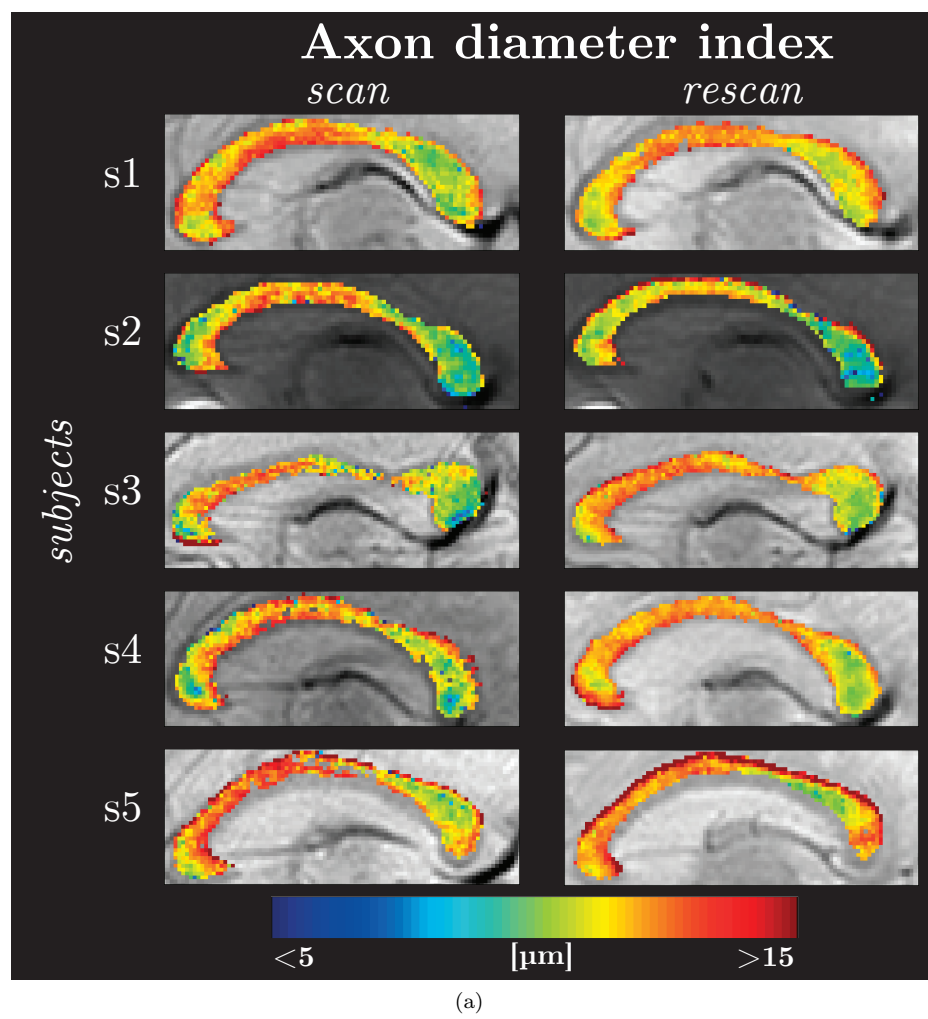


Figure 1.1: XX

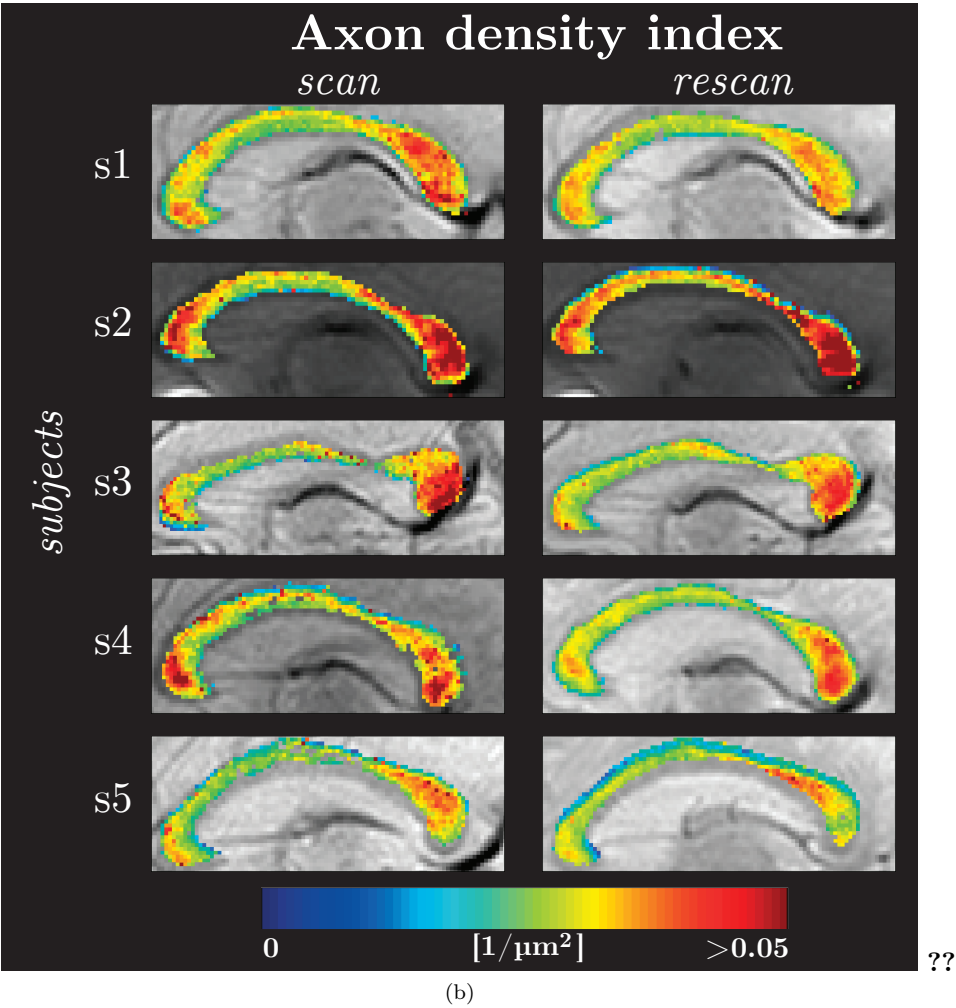
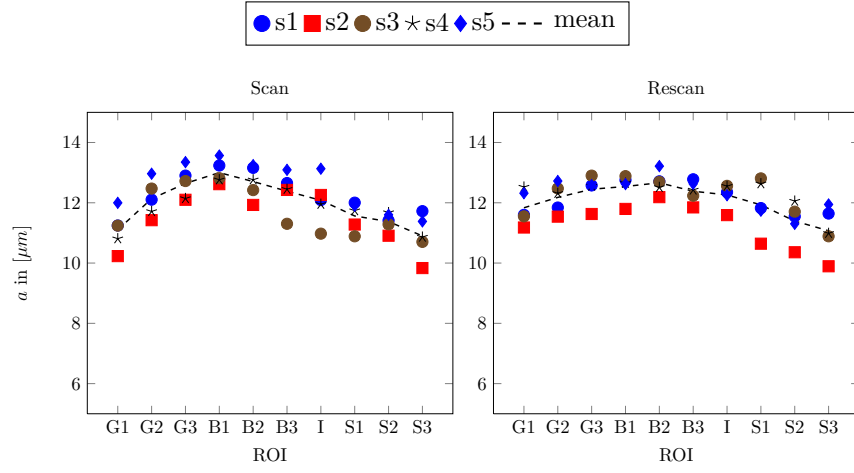
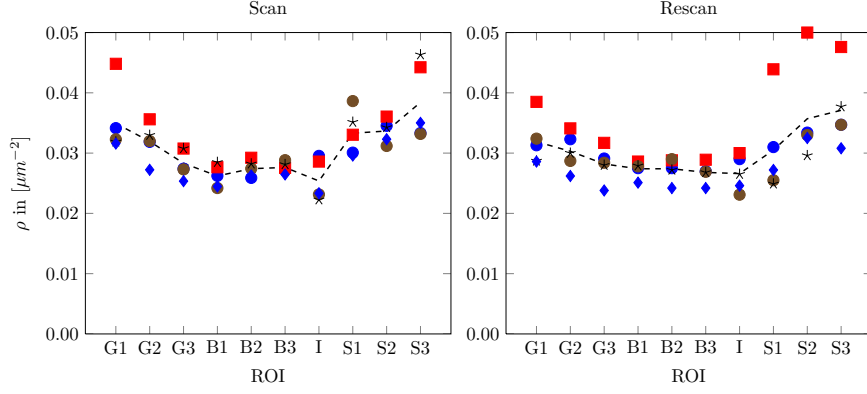


Figure 1.1: XX (continued)



(a) Axon diameter index



(b) Axon density index

Figure 1.2: Scatter plots of axon diameter (a) and axon density (ρ) indices in all 5 subjects in individual ROIs. The dashed line shows the average over all subjects.

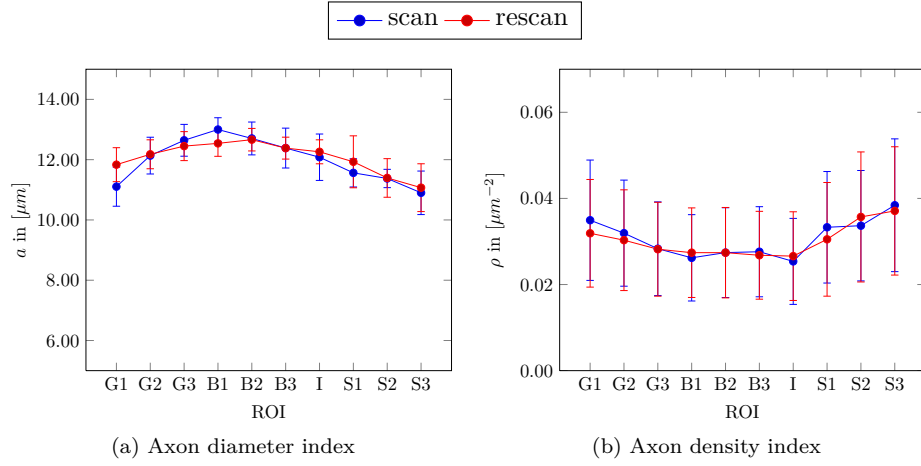


Figure 1.3: Scatter plots of axon diameter (a) and axon density (ρ) indices in all 5 subjects in individual ROIs. The dashed line shows the average over all subjects.

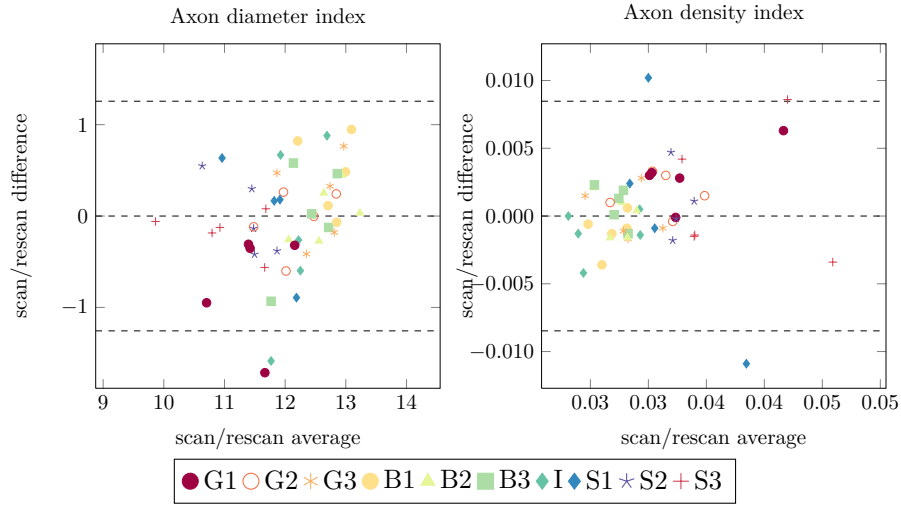


Figure 1.4: XX

Bibliography

- Alexander, D. C. (2008). A general framework for experiment design in diffusion MRI and its application in measuring direct tissue-microstructure features. *Magnetic Resonance in Medicine*, 60(2), 439–448.
- Alexander, D. C., Hubbard, P. L., Hall, M. G., Moore, E. A., Ptito, M., Parker, G. J. M., & Dyrby, T. B. (2010). Orientationally invariant indices of axon diameter and density from diffusion MRI. *NeuroImage*.
- Assaf, Y., Blumenfeld-Katzir, T., Yovel, Y., & Basser, P. J. (2008). AxCaliber: a method for measuring axon diameter distribution from diffusion MRI. *Magnetic Resonance in Medicine*, 59(6), 1347–1354.
- Avram, L., Ā-zarslan, E., Assaf, Y., Bar-Shir, A., Cohen, Y., & Basser, P. J. (2008). Three-dimensional water diffusion in impermeable cylindrical tubes: theory versus experiments. *NMR Biomed.*, 21(8), 888–898.
URL <http://dx.doi.org/10.1002/nbm.1277>
- Barazany, D., Basser, P. J., & Assaf, Y. (2009). In vivo measurement of axon diameter distribution in the corpus callosum of rat brain. *Brain*.
- Cook, P. A., Symms, M., Boulby, P. A., & Alexander, D. C. (2007). Optimal acquisition orders of diffusion-weighted MRI measurements. *Journal of Magnetic Resonance Imaging*, 25(5), 1051–1058.
URL <http://dx.doi.org/10.1002/jmri.20905>
- Golabchi, F. N., Brooks, D. H., Hoge, W. S., Girolami, U. D., & Maier, S. E. (2010). Pixel-based comparison of spinal cord MR diffusion anisotropy with axon packing parameters. *Magn Reson Med*, 63(6), 1510–1519.
- Panagiotaki, E., Schneider, T., Siow, B., Hall, M. G., Lythgoe, M. F., & Alexander, D. C. (2012). Compartment models of the diffusion mr signal in brain white matter: A taxonomy and comparison. *NeuroImage*, 59(3), 2241–2254.
URL <http://www.sciencedirect.com/science/article/pii/S1053811911011566>
- Siow, B., Drobnjak, I., Chatterjee, A., Lythgoe, M. F., & Alexander, D. C. (2012). Estimation of pore size in a microstructure phantom using the optimised gradient waveform diffusion weighted nmr sequence. *Journal of Magnetic Resonance*, 214(0), 51–60.
URL <http://www.sciencedirect.com/science/article/pii/S1090780711003806>

- Stanisz, G. J., Wright, G. A., Henkelman, R. M., & Szafer, A. (1997). An analytical model of restricted diffusion in bovine optic nerve. *Magnetic Resonance in Medicine*, 37(1), 103–111.
URL <http://onlinelibrary.wiley.com/doi/10.1002/mrm.1910370115/abstract>
- Stejskal, E. O., & Tanner, J. E. (1965). Spin Diffusion Measurements: Spin Echoes in the Presence of a Time-Dependent Field Gradient. *Journal of Chemical Physics*, 42, 288.
- Szafer, A., Zhong, J., & Gore, J. C. (1995). Theoretical model for water diffusion in tissues. *Magnetic Resonance in Medicine*, 33(5), 697–712.
URL <http://onlinelibrary.wiley.com/doi/10.1002/mrm.1910330516/abstract>
- Wang, Y., Wang, Q., Haldar, J. P., Yeh, F.-C., Xie, M., Sun, P., Tu, T.-W., Trinkaus, K., Klein, R. S., Cross, A. H., & Song, S.-K. (2011). Quantification of increased cellularity during inflammatory demyelination. *Brain*, 134(12), 3590–3601.
URL <http://brain.oxfordjournals.org/content/134/12/3590>
- Zhang, H., Hubbard, P. L., Parker, G. J., & Alexander, D. C. (2011). Axon diameter mapping in the presence of orientation dispersion with diffusion mri. *NeuroImage*, 56(3), 1301–1315.
URL <http://www.sciencedirect.com/science/article/pii/S1053811911001376>